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Earth-moving machinery — Access systems

Engins de terrassement — Moyens d'accès

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 2867 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety, ergonomics and general requirements*.

This seventh edition cancels and replaces the sixth edition (ISO 2867:2006), which has been technically revised.

Introduction

The structure of safety standards in the field of machinery is as follows.

a) Type-A standards (basic standards) give basic concepts, principles for design and general aspects that can be applied to machinery.

b) Type-B standards (generic safety standards) deal with one safety aspect or one type of safeguard that can be used across a wide range of machinery:

   — type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);

   — type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure-sensitive devices, guards).

c) Type-C standards (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This document is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

NOTE ISO 14122 is a series of type-B standards that provides general requirements for access to stationary and mobile machines and that can be used as a general reference for the design of access systems for earth-moving machines.

Earth-moving machinery — Access systems

1 Scope

This International Standard specifies criteria for systems that provide access to the operator station and to routine maintenance points on earth-moving machinery as defined in ISO 6165. It is applicable to the access systems (e.g. enclosure openings, platforms, guardrails, handrails and handholds, stairways and steps, ladders) on such machines parked in accordance with the manufacturer's instructions. Its criteria are based on the 5th to 95th percentile operator dimensions as defined in ISO 3411. It deals with the following significant hazards, hazardous situations and events: slip, trip and fall of persons, unhealthy postures and excessive effort.

The general principles set out in this International Standard can be used for the selection of fixed and/or portable access systems for repairs, assembly, disassembly and longer interval maintenance.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3411, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

ISO 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO 12508, *Earth-moving machinery — Operator station and maintenance areas — Bluntness of edges*

ISO 14122-1:2001, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels*

ISO 14122-4, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders*

ISO 14567, *Personal protective equipment for protection against falls from a height — Single-point anchor devices*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 General terms and definitions

3.1.1
target dimension
dimensional value that takes into account ergonomics criteria based on comfort

NOTE Acceptable values are within the specified range (from minimum to maximum).

3.1.2
machine repairs
work on a machine that is done as a result of a machine failure

3.1.3
routine maintenance points
locations on a machine that are specified in the periodic maintenance schedule of the operator's manual for performing scheduled daily/weekly/monthly maintenance on the machine

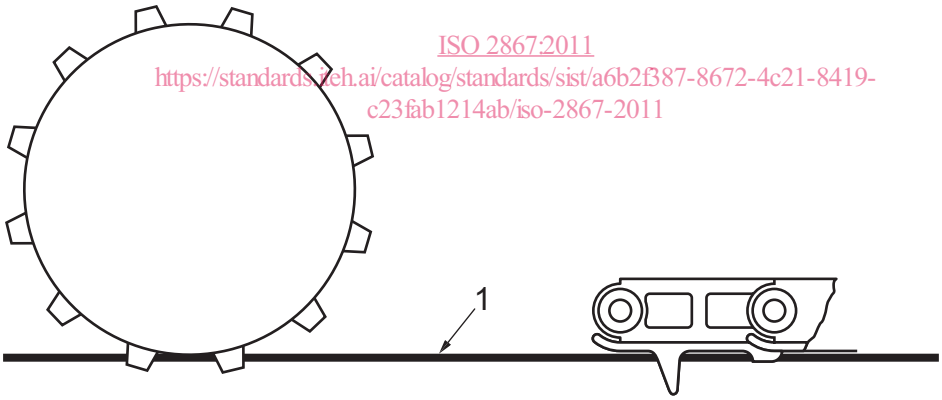
3.1.4
two-point support
feature of an access system that enables a person to use, simultaneously, both feet, or one hand and one foot, while ascending, descending or moving about on the machine

3.1.5
three-point support
feature of an access system that enables a person to use, simultaneously, both hands and one foot, or both feet and one hand, while ascending, descending or moving about on the machine

3.1.6
operator station
area from which an operator controls the travel and work functions of the machine

3.1.7
ground
surface on which a machine is positioned, taking into account full penetration of pad feet or track grousers

See Figure 1.



Key

1 ground reference plane (GRP)

Figure 1 — Ground location for machines with pad feet or track grousers

3.2 Access systems

3.2.1
access system
system provided on a machine for ascending from the ground or descending to the ground or for moving from one area on the machine to another area

3.2.1.1
primary access system
access system used for ascending from the ground to the operator station or descending to the ground from the operator station

3.2.1.2
retractable access system
access system that has a portion that retracts (e.g. rotates, translates, telescopes, articulates), with or without a power source, from a stored position before being used

3.2.1.3
powered retractable access system
access system that is retracted by a power source on the machine

3.2.2
alternative exit path
route from the operator station to the ground used during situations in which the primary access system cannot be used

3.2.3
secondary access system
access system used for ascending from the ground to the operator station or descending from the operator station to the ground during situations in which the primary access system cannot be used

3.3 Enclosure openings

3.3.1
enclosure opening
opening leading to or from an access system, intended for a person to pass through

3.3.1.1
primary opening
enclosure opening used for normal ingress to and egress from the operator station

3.3.1.2
alternative opening
enclosure opening intended for use during situations when the primary opening is not usable

3.3.1.3
maintenance opening
enclosure opening for use during routine maintenance

3.4 Walking and standing areas

3.4.1
walkway
part of an access system that permits walking or moving from one area on the machine to another area

3.4.1.1
boom walkway
walkway used mainly on long booms

3.4.1.2
passageway
walkway with confining barriers on both sides

3.4.2
platform
horizontal surface intended for the support of persons engaged in operation or routine maintenance

3.4.2.1
rest platform
platform used between parts of an access system on which a person may rest

3.4.3
ramp
plane inclined at an angle of 20° or less from the horizontal

3.5 Guardrails, handrails and handholds

3.5.1
guardrail
device installed along the open sides of walkways or platforms providing protection from falling

3.5.2
handrail
device for hand placement that aids body support and balance and permits hand movement on the device while moving on an access system

3.5.3
handhold
device for single hand placement that aids body support and balance

3.6 Stairways and steps

3.6.1
stairway
access system, or part of an access system, inclined from the horizontal at an angle greater than 20° but not more than 50°, consisting of three or more steps

3.6.2
step
device for placement of one or both feet, either as part of a ladder or stairway, or installed (placed) as an individual step or a series of steps

3.6.3
flexible step
step mounted with a material which moves when it contacts an obstacle and returns to the original location

3.6.4
riser height
height between two consecutive steps, measured from the tread surface of one step to the tread surface of the next step

3.6.5
tread depth
distance from the leading edge to the back of the step

3.6.6
stride distance
horizontal distance from the leading edge of one step to the leading edge of the next step

3.6.7
track frame step
step that is an integral part or added component of the track frame

3.7 Ladders

3.7.1
inclined ladder
ladder with an angle of inclination from the horizontal greater than 75° but not more than 80°

3.7.2
vertical ladder
ladder with angle of inclination from the horizontal greater than 80° but not more than 90°

3.7.3
step ladder
ladder with angle of inclination from the horizontal greater than 50° but not more than 75°

3.7.4
flight
uninterrupted sequence of steps

3.8 Slip and fall

3.8.1
personal fall arrest system
PFAS
system designed to stop the fall of a person before collision with the ground or other obstruction

3.8.2
personal fall restraint system
PFRS
system that restrains or hinders a person from reaching a fall point

3.8.3
slip-resistant surface
access system surface having qualities that improve the grip of footwear or other contact combination (e.g. as when crawling)

3.8.4
foot barrier
device intended to hinder a person's foot from slipping off the edge of a platform, step or walkway

3.8.5
ladder fall limiting device
device that minimizes the risk of falling from a ladder system

4 Requirements for access systems

4.1 General

4.1.1 The selection of the type of access system between two levels shall be in accordance with ISO 14122-1:2001, Clauses 4 and 5, and the following.

4.1.2 In the design of an access system:

— use inclined ladders whenever possible, instead of vertical or step ladders with an angle of 60° to 75°;

— the surface of wheels and tyres are not acceptable as part of the access system;

— track surfaces are acceptable as part of the access system if three-point support is provided, but whenever practical, use a type of access system other than the track surface as a walkway;

— the potential for damage to the access system, and masking of visibility around the machine, machine equipment or attachments shall be evaluated.

4.1.3 Correct use of the access system for hand and foot placement shall be self-evident without special training. Instructions for retractable access systems shall be included in the operator's manual. Instructions shall be provided regarding the need for inspection for wear or damage, including to slip-resistant surfaces, of the access system. The instructions shall state when the manufacturer recommends other access system aids.

Retractable access systems shall include instructions for use in the machine operations manual and on an information label near the access system, as appropriate.

4.1.4 Protrusions into the access system that could create a hazard for tripping or for catching or holding body appendages shall be minimized.

4.1.5 The access system shall be designed to minimize the potential for the user to come into contact with hazards such as surfaces having extreme temperatures (heat or cold), or areas with electrical hazards, moving parts or sharp corners.

4.1.6 All surfaces of the access system designed for walking, climbing, stepping or crawling shall be slip-resistant (including any device or structural component designed as part of an access system). This is not relevant for the track surfaces referred to in 4.1.2. See Annex A for examples of slip-resistant surfaces.

4.1.7 Proper placement of components of the access system shall permit and encourage a person to maintain three-point support while using an access system that is more than 1 m above the ground. Two-point support above 1 m is acceptable for stairways, ramps, walkways and platforms.

4.1.8 If the operator or a maintenance person needs to carry items to the operator station or to a routine maintenance point, a system such as one of the following shall be provided (together with corresponding instructions in the operator's manual if this is not obvious):

— a stairway or ramp to provide access where two-point support is adequate and one hand can be available for carrying items;

— additional platforms or surfaces, with minimum dimensions of 300 mm by 400 mm every 1,7 m of height on a continuous climbing access system, where items can be temporarily placed so that three-point support can be maintained when moving on the access system;

— a procedure or system (e.g. rope pulley system) for transferring items to the operator station or routine maintenance point so that three-point support can be used on the access system at all times.

NOTE Routine maintenance points serviced from the ground meet these requirements.

4.1.9 Illumination shall be provided for the primary access system to the operator station if the platform of the operator station is at a height of more than 3 m. Activation of lights shall be possible from the ground and the operator station.

4.1.10 Access systems shall be fitted for the use and daily maintenance of attachments or options (e.g. mirrors) provided by the machine manufacturer.

4.1.11 For routine maintenance intervals that exceed one month, other access system aids, such as personal fall arrest systems (PFASs), personal fall restraint systems (PFRSs), or an external access system (e.g. portable working platform, stairway) can be used. The operator's manual shall provide guidance for the use of other access system aids. Anchorage points, if provided, shall be in accordance with ISO 14567.

4.1.12 Access for machine repairs shall be covered in the manufacturer's available instructions (e.g. machine repair manual, dealer repair manual, service manual). Access systems for machine repairs can be provided on the machine or manufacturer's instructions can provide recommendations for use of external access systems (e.g. portable working platform, or stairway).

4.1.13 Parts of access systems that are likely to be damaged by contact with objects or the ground shall be designed for easy replacement.

